

and of incorporating these into risk analysis. Such contributions could have formed the basis of a useful book, drawing on material from other contributions and discussing, *inter alia*, the problems of adapting the regulatory approach of the EU and the USA to developing countries with peasant and marginal economies. Such a book would have been valuable both to those at present working in the chemical industry and to students in chemical engineering and related disciplines.

Finally, a comment must be made on the style of the contributions. The proof-reading and author-checking are, overall, of the low standard that now seems to be inevitable; in some cases the printers have used completely the wrong word, which leaves the reader floundering. This apart, some of the contributions are very well written, but others are less so. It may seem unfair to criticise authors who do not have English as their first language; in fact, many of these have done an admirable job, and others would have benefited from (and, I am sure, would have appreciated) firm editing. However, it is apparent that they would be unlikely to receive this, for the Editor's own contributions are the worst in the book in terms of style, grammar and punctuation. This is not just pedantry over split infinitives and the like; I gritted my teeth and ignored the singular nouns with plural verbs (and vice versa), the changes of tense within a sentence, the hanging participles, the subordinate clauses divorced by a distance from their subjects, although I did wonder how a non-English speaker would cope. However, a reader should not have to stop to determine what a sentence or paragraph actually means; still less should he, on occasion, have to admit defeat. In case it is felt that I am dense or hypercritical, I offer: 'There is an accelerating aspect to the global nature of these problems which is growing with the international requirement involved in the nature of our economy, which are inexorably interlinked with the vast increase in our knowledge in development in health technologies and techniques in the more adverse effects to the natural environment and methodologies in environmental toxicology.'

R. E. Ford

The ecology of agricultural pests: Biochemical approaches, ed. W. O. C. Symondson & J. E. Liddell, Chapman and Hall, London, 1996, 517 pp., price UK£75.00.
ISBN 0 412 62190 8.

This most useful volume results from an international symposium held at the University of Wales Cardiff in September 1994. It consists of a series of peer-reviewed chapters which focus on the use of electrophoretic, immunological and molecular techniques for the study

of pest insect taxonomy, population genetics and population dynamics. Newer and more powerful techniques to measure and understand the interactions between pests, their hosts, predators and other organisms now significantly advance our ability to study pest insect ecology and that this subject has progressed rapidly since the previous Systematics Association Special Volume (No. 39) on the use of electrophoretic techniques, is evidenced, by the large number of chapters employing molecular biological methods. Of the 21 chapters in this volume, 10 use such methods either exclusively or in combination with other methods.

A good starting point is the very competent review by Loxdale and co-authors which examines the molecular techniques which are of use to agricultural entomologists. These include the study of ribosomal DNA (rDNA) in phylogenetic studies, as taxonomic markers and for examining population structure and dynamics, studies on restriction fragment length polymorphism (RFLP) and the use of the polymerase chain reaction (PCR). The review continues by detailing the detection of microsatellite DNA using PCR, the study of mitochondrial DNA (mtDNA) and RFLP analysis of population genetic structure, gene flow and mating systems. Perhaps most usefully of all, the review examines the use of the random amplified polymorphic DNA-polymerase chain reaction (RAPD-PCR).

A range of practical examples of the use of these techniques is presented. One of these examines the genetic relatedness of weevil strains and populations and the interactions between weevils and their endosymbionts and parasitoids. Other examples include the use of RAPD-PCR in a study of the taxonomy, distribution and ecology of slugs, the use of nuclear and mtDNA in brown planthopper taxonomy, the use of mtDNA markers in a study of the population genetics and ecology of the desert locust and the use of rDNA, PCR and RAPD-PCR in studies on introduced pests in New Zealand.

Two chapters by Hemingway *et al.* and Daly and Trowell emphasise the value of multidisciplinary approaches to the study of resistance to insecticides. Combinations of electrophoretic, immunological and molecular methods can be used in species identification, resistance detection and monitoring and studies on resistance gene flow in populations.

Almost one-third of the volume is devoted to the serological analysis of predator-prey relationships. An excellent and extensive contribution by Greenstone reviews the use of polyclonal and monoclonal antibody techniques and immunological assays including ELISA and concludes with a brief consideration of the recent developments including the use of PCR techniques. The subject is brought right up to date in a number of contributions by the two editors, Liddell and Symondson. One of these considers the use of recombinant antibody techniques as an alternative to costly and time-

consuming conventional methods of antibody production. Genes coding for antibody fragments that are responsible for antibody binding can be isolated and cloned into vectors that allow the recombinant antibody fragments to be displayed on the surface of phage. Those that bind antigen, and the genes they contain, can be isolated from libraries of millions of different specificities. The power of the technique to increase the speed of production, increase the diversity of specificities available and the ability to fine tune the affinities and specificities of antigen binding by manipulating the isolated gene sequences is impressive.

This section of the volume is completed by a number of chapters which consider specific examples of serological studies. These include the use of a monoclonal-antibody-based immuno-dot assay for a braconid parasitoid of the corn earworm, use of a monoclonal antibody to examine predation of cotton bollworm eggs in field crops in India, use of monoclonal antibody techniques to detect predators of whiteflies and predators of pink bollworm in the USA and use of polyclonal and monoclonal techniques to examine slug predation.

An important consideration in this field is the extent to which assay data can be converted into ecologically useful information. Indeed, as indicated by the contents of this volume, there is a wealth of technology which enables one to detect insect proteins. It is tempting to suggest that this technology appears to have outstripped the ability to interpret the findings. A thought-provoking assessment of the interpretation of such studies by Sunderland rightly highlights such issues and, for instance, makes the distinction between consumption rate and predation rate; essential reading for anyone considering using such techniques.

A number of chapters effectively update the reader on the electrophoretic techniques which were the subject of the previous symposium. An illuminating opening chapter focuses on biochemical methods for species identification in groups of pest insects that are notoriously rich in sibling species, where species identification in immature stages is difficult on morphological grounds and on the analysis of population structure and intraspecific differentiation. This section is completed with two papers that review the use of electrophoretic techniques to examine esterase polymorphism in US populations of the cotton bollweevil and in the study of predator-prey relationships. The volume is completed with a chapter by Langley which details practical techniques for determining the age and nutritional status of tsetse flies.

It is a pity that the book is not sub-divided into sections. The distribution of chapters seems a little arbitrary in places and the reader might have expected topics to be grouped rather more tightly. These minor quibbles aside, this excellent book contains a wealth of information of value to applied entomologists, ecologists and all those involved in pest management. The

symposium organisers and editors are to be congratulated on a very useful and timely volume.

Alan R. McCaffery

Induced responses to herbivory. ed. R. Karban & I. T. Baldwin, The University of Chicago Press, Chicago, 1997, ix + 319 pp., price US\$27.95, UK£14.25. ISBN 0 226 42496 0.

This is a stimulating and authoritative book written by two pioneers of the subject. Induced defence against attack by herbivorous animals is currently one of the most exciting areas of natural science, and a book that so well encompasses the subject in such a readable and compact form is essential for libraries and individuals concerned with any aspect of plant science, not least crop protection. There are six chapters, the first providing an introduction to the phenomenology of induction, with definitions of induced response, resistance and defence. There is also a brief history of what is none the less a very young subject. The next chapter describes how plants perceive damage and discusses the specificity of the processes involved. A table of signals that are proposed to operate within plants, giving possible roles and evidence for their existence, is an invaluable component and includes early studies on the oligosaccharide fragments and recent developments with salicylic acid and jasmonic acid. This chapter becomes even more useful when it discusses, in a critical and informed fashion, communication between individual plants. The chapter concludes that there is increasing evidence of volatile cues released by damaged plants being exploited by herbivores and their predators and parasites, but that it is yet to be proven whether such signals are also used by unattacked neighbouring plants.

The mechanism of induced responses is then described, looking first at the induction of primary metabolism and moving to the extensive, although recent, literature on the induction of secondary metabolites. An important part of this chapter is devoted to describing the various mechanisms for induced chemical defences, followed by control processes: synthesis, synthesis and turnover, and transport, exemplified by proteinase inhibitors, phytoalexins and nicotine respectively, with the first example allowing discussion of the ground-breaking work by Clarence (Bud) Ryan of Washington State University on these important defence proteins and their inductions. In the fourth chapter, there is an extensive tabulation of where induced resistance has been found. This is accompanied by a critical discussion on use of bioassays involving herbivores to determine the effect of induced resistance and susceptibility after initial plant damage. Here, we